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Multi-Sensor/Multi-Spectral Sensor Fusion Testing Issues						
Example Applications						
Distributed Training and Test Applications						
Summary						
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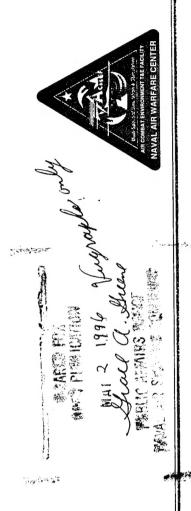
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Air Combat Environment Test and **Multi-spectral Sensor Fusion** Evaluation Facility (ACETEF) Support for Multi-sensor, **Testing**

Dan Macone NAWC-AD Patuxent River, Md.



Outline



- Description of ACETEF
- Multi-Sensor/Multi-Spectral Sensor Fusion **Testing Issues**
- Example Applications
- Distributed Training and Test Applications
- **Summary**



Purpose of ACETEF



Purpose:

Test of installed avionics systems

Provide a realistic simulated environment

Provide ground test to complement flight test

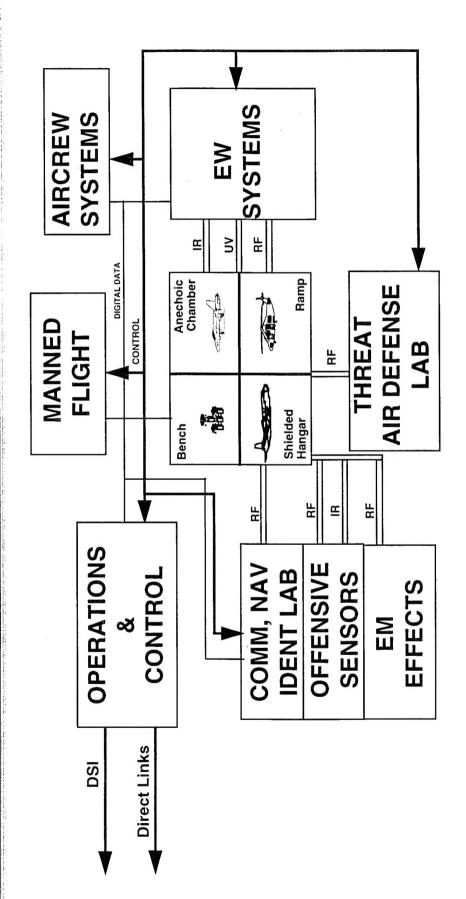
Maximize platform test productivity

Reduce program risk!



ACETEF ARCHITECTURE





Warfare Simulation

Man-in-the-Loop Simulation

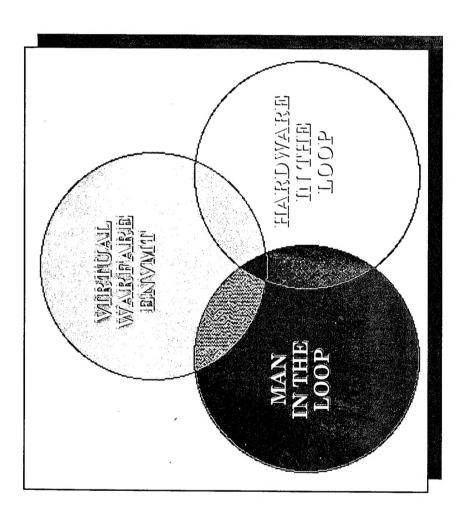
☐ Hardware-in-the-Loop Stimulation

☐ Installed Systems Test



ACETEF TEST ENVIRONMENT



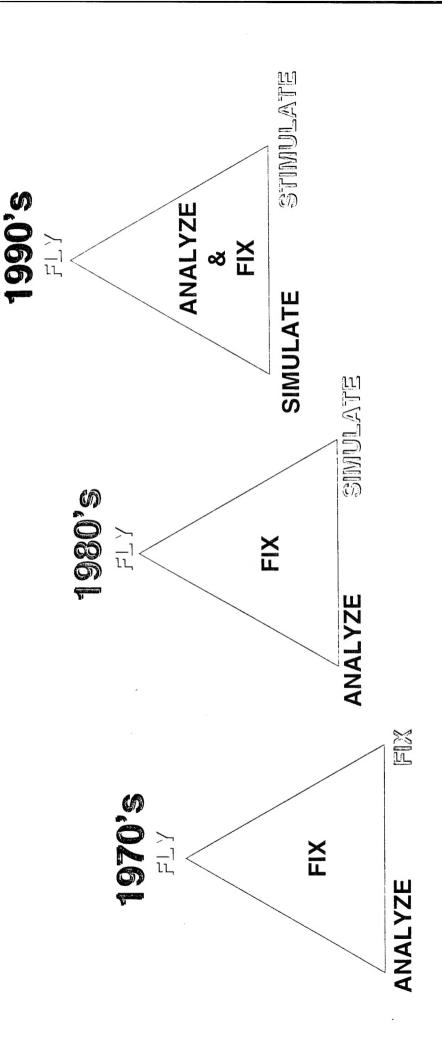




T&E METHODOLOGY



THE EVOLUTION OF TRE METHODOLOGY





Testing Issues



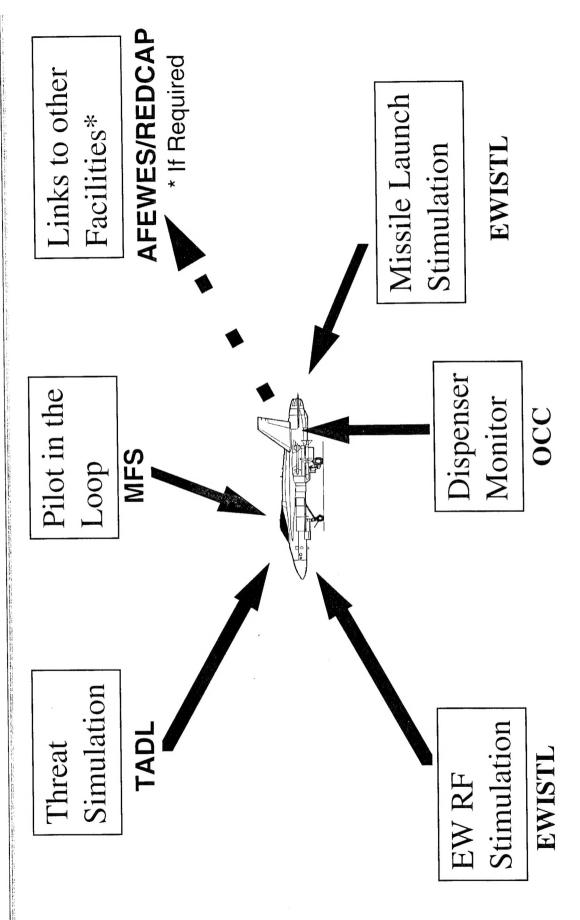
- Realistic system under test loading
- Realistic "test" C4l Architectures/ Loading
- Realistic/varied background
- "Coherent Scenarios"
- Integration of Missile Warning and Countermeasures

- •IR and Semi-active Missile Seeker end game testing.
- Highly dynamic scenarios
- Numbers/types of targets
- Coordination of Surveillance Assets
- Training/Calibration of Knowledge Based Algorithms vs testing



On-Board Defensive Multi-Sensor ACETEF Test Scenario

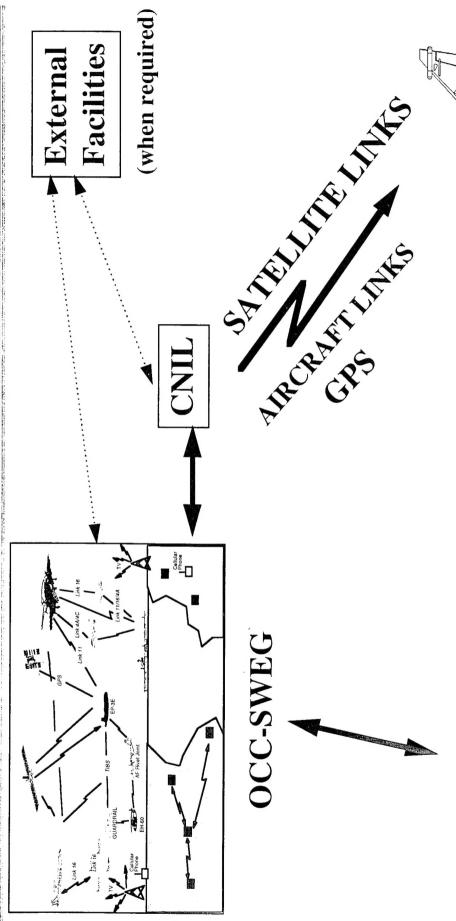






Defensive On-Board/Off-Board ACETEF Test Scenario





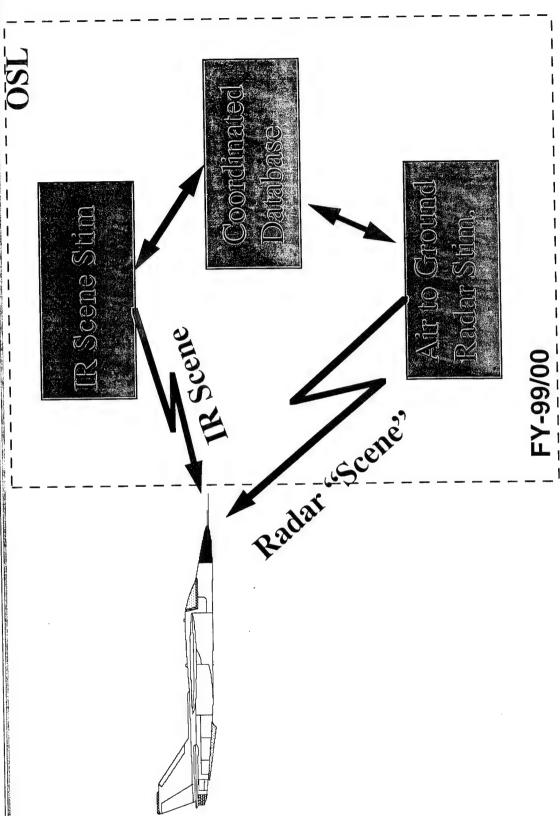
RF ENVIRONMENT

EWISTL/TADL



Offensive On-Board Air to Ground ACETEF Test Scenario

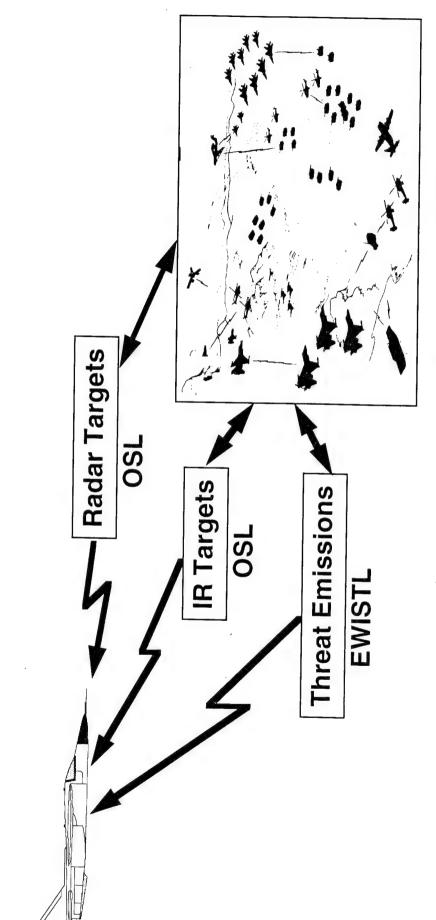






Offensive On-Board Air to Air ACETEF Test Scenario



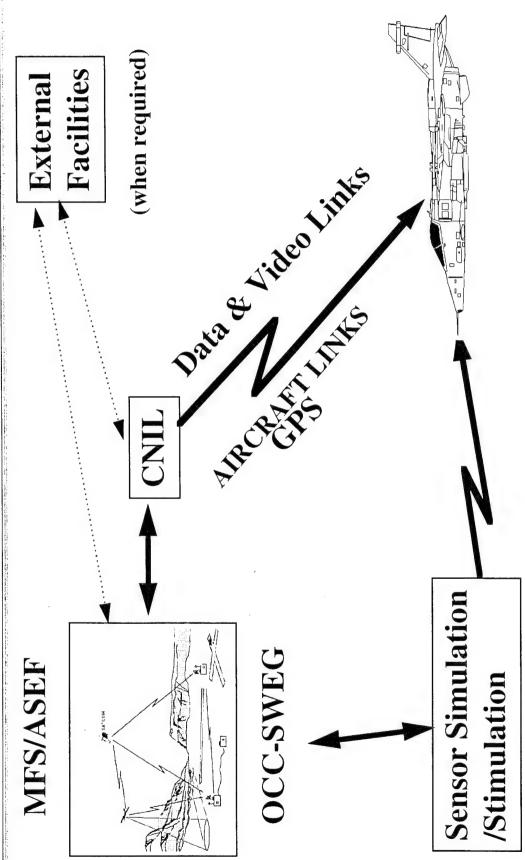


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Offensive On-Board/Off-Board ACETEF Test Scenario





OSL - ASEF



Distributed Simulation Examples

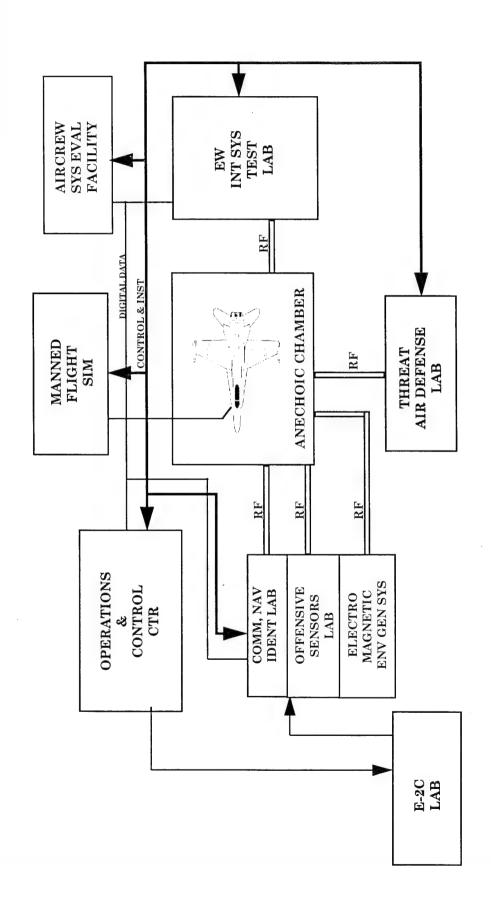


- Virtual Simulation & Stimulation--F/A-18 War at Sea
- Synthetic Theater of War-Europe
- **KERNEL BLITZ '95**
- DMSO High Level Architecture Engineering **Proto-Federation**



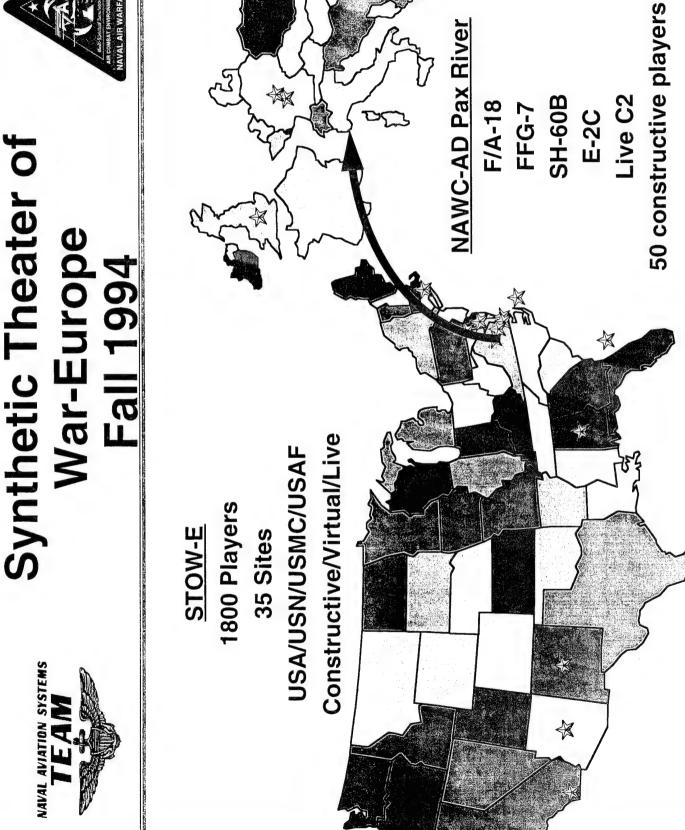
Test Architecture





War-Europe

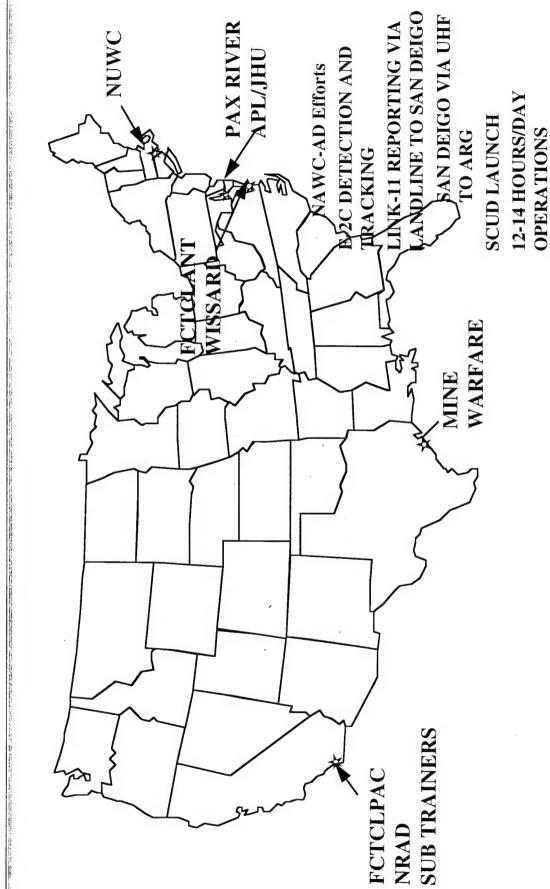






KERNEL BLITZ SIMULATION SITES







DMSO High Level Architecture Engineering Protofederation Composition



- ACETEF (NAWCAD PAX)
- SWEG
- TADL
- MFS
- **EWISTL**
- **AFEWES Fort Worth, Texas**
- REDCAP, Buffalo, New York
- Chesapeake Test Range (NAWCAD PAX)
- Wright Lab (Dayton, Ohio)
- JMASS
- MSIC (Redstone Arsenal, Alabama)
- **Aberdeen Proving Ground**
- Simulation Based Design



Sensor Fusion Testing Examples in Distributed Simulatoin



- Airborne AAW Coordinator to Fighter
- E-2C via voice and Link-4A
- Hardware in the loop RWR
- Simulated Radar
- Visual Data
- E-2C, AEGIS, AWACS
- Link 11 (land line) and Voice
- E-2C, AEGIS, AWACS, Fighter
- Link 11 (land line), Link 4 (live) and Voice
- Onboard Radar and visual (simulated)
- E-2C, AEGIS, SSN-688, FFG-7, SH-60B
- Link-11, Lamps Data Link, Voice
- Link 11 Coordination with simulation assets and live assets engaged in at sea training exercise.



LIMITATIONS



- Fusion was performed manually
- IFF Simulation was limited
- Link quality, gridlock problems
- IFF simulation via DIS
- Limited C4I Simulation (Tactical Links only)
- Manual systems



Conclusions



ACETEF provides significant capabilities to support multi-sensor fusion efforts Air to ground sensor fusion - longer term

capabilities can support a wide variety of ACETEF along with distributed simulation programs T&E facilities can provide support to Training exercises Training exercises provide a rich environment for conducting T&E

Still a long way to go!!!



Wrap UP



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- http://setd.nawcad.navy.mil